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09/600,936	10/03/2000	Mitsuaki Nakamura	49917(868)	2694

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EDWARDS & ANGELL, LLP
P.O. BOX 55874
BOSTON, MA 02205

EXAMINER	
EDWARDS, PATRICK L	

ART UNIT	PAPER NUMBER
2621	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/600,936	NAKAMURA ET AL.	
	Examiner	Art Unit	
	Patrick L. Edwards	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 September 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6 and 8-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6,8-12 and 14-29* is/are rejected.

7)☒ Claim(s) *13* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 09-28-2005 has been entered.

Response to Arguments

2. Applicant's arguments filed on 09-28-2005 have been fully considered. A response to these arguments is provided below.

Prior Art Rejections

Summary of Argument:

Applicant has amended independent claims 1 and 2 by adding a limitation regarding the linear symmetricality of a gradation conversion curve.

Examiner's Response:

This new limitation will be discussed in the below rejection.

Allowable Subject Matter

3. Claim 13 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and all intervening claims.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 14, 15, 18, and 26 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

These claims recite "making the luminance data linearly symmetrical with the gradation characteristics so that the gradation characteristics of the display device are linear at the same time." The limitation is ambiguous because the language "at the same time" indicates a comparison with something else, but no such comparison is given. Thus as currently recited, the phrase is open-ended and nonsensical.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1 and 9 are rejected under 35 U.S.C. 103a as being unpatentable over the combination of Shiraiwa (US Patent 6,201,893) and Hayashi (USPN 6,271,934).

With respect to claim 1, which is representative of claim 9, Shiraiwa discloses a display means with predetermined gradation characteristics (column 3, line 54 and element 40 of Figure 1). Although predetermined gradation characteristics are not explicitly disclosed in Shiraiwa, it is well known in the art that display devices are inherently associated with predetermined gradation characteristics.

Shiraiwa also discloses an image input means for inputting an image composed of pixels (column 3, line 52). The color image pickup unit (element 10 of Figure 1) disclosed in Shiraiwa is analogous to an input means as stated in the application.

Shiraiwa discloses a contrast estimation means (discussed in the below paragraph).

Shiraiwa further discloses a luminance correction means. The 'image reproduction processing section' (element 35) is analogous to the claimed luminace correction means (Shiraiwa col. 8 lines 12-16: The reference describes using 'separately determined image reproduction parameters' to determine one specific image reproduction parameter, and then processing the image based on this parameter). Thus, Shiraiwa clearly discloses performing luminance correction (e.g. white balance adjustment, as disclosed at col. 5 lines 27-28). Shiraiwa also clearly discloses that the luminance corrrection means is based on estimated contrast (e.g. the intensity distribution, or the wiener spectrum (which is a measurement of noise power density which requires a contrast estimate for its determination), or the color range (another estimate of contrast), etc.) (col. 4 lines 20-34). Shiraiwa also clearly discloses that the luminance correction means is based on gradation characteristics (col. 4 lines 25-27: The reference describes a 'gradation characteristic', a 'gradation conversion curve', and a 'gradation conversion look up table'). These gradation characteristics are associated with a display device, as is discussed in the above response to arguments.

Shiraiwa discloses a luminance correction means that utilizes gradation characteristics. However, Shiraiwa fails to expressly disclose that this luminance correction comprises making the luminance pixels linearly symmetrical with the gradation characteristics. Hayashi, on the other hand, discloses specifics of a gradation curve and shows that this conversion curve is linearly symmetric (i.e. the correction comprises making luminance pixels linearly symmetrical with gradation characteristics) (Hayashi Fig. 7 in conjuntion with col. 10 lines 36-39 and col. 11 lines 37-59 and elsewhere in the specification: The Figure and accompanying description in hayashi show a gradation conversion curve for luminance correction which produces linearly symmetrical luminance correction

results.). It would have been obvious to one reasonably skilled in the art at the time of the invention to modify Shiraiwa's method of correcting luminance by using a gradation conversion curve to ensure that this correction produced a linearly symmetrical result as taught by Hayashi. Such a modification would have allowed for an effective and easily implementable gradation conversion curve that was well known in the art.

Shiraiwa also discloses that said display means display an image that has been corrected by said luminance correction means (column 4 lines 48-51).

8. Claims 2, 6, 8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Shiraiwa, Hayashi, and Tokuyama (US Patent 6,240,206). The arguments as to the relevance of Shiraiwa and Hayashi as applied to claim 1 above is incorporated herein.

With regard to claim 2, which is representative of claim 10, Shiraiwa discloses a display means having predetermined gradation characteristics, an image input means for inputting an image composed of a plurality of pixels and a luminance correction means that corrects the luminance of pixels constituting an image based on gradation characteristics. Shiraiwa additionally discloses that said display means displays the image in which the luminance of each of the pixels has been corrected by the luminance correction means. Shiraiwa does not disclose a character region extraction means or a sharpening means.

Tokuyama discloses a character region extracting means for extracting character regions from an image (column 2, lines 20-28). The region separating section (element 12, Figure 1) as disclosed in Tokuyama is analogous to a region extracting means as stated in the application.

Tokuyama discloses carrying out sharpening for the character region at a sharpening level higher than the level of sharpening performed for the remaining regions (Tokuyama col. 11 line 37 – col. 12 line 16 in conjunction with Figure 10). This occurs in the event that the value of XB is between 0 and –25000, the value of XA is between 0 and 50000, and the value of XC is between 0 and 25000. In this situation, the photographic and spot regions (which correspond to XA and XC, respectively) are filtered at one of the predetermined sharpening levels shown in Figures 11(a)-(i) and the character region (which corresponds to XB) is filtered at a sharpening level higher than the other regions. The degree of enhancement as disclosed in Shiraiwa is analogous to the level of sharpening recited in the claim.

It would have been obvious to one reasonably skilled in the art at the time of the invention to modify the image processing system of Shiraiwa to include character region extraction means and sharpening means for sharpening character regions at a higher level than non-character regions as taught by Tokuyama. Such a modification would have allowed for an image processing apparatus capable of improving the quality of an image comprised of character regions and non-character regions.

With regard to claim 6, Shiraiwa discloses contrast correction means for raising the contrast of the image on the basis of estimated contrast (Shiraiwa column 6 lines 53-59). Shiraiwa discloses performing luminance distribution smoothing processing on an image on the basis of its contrast. Luminance distribution smoothing is a method well known in the art for enhancing the contrast of an image. Enhancing the contrast of an image is

analogous to raising the contrast of an image or lowering it as needed based on the histogram of luminance levels (column 6 lines 57-58). Said luminance distribution smoothing determines image reproduction parameters for pixel luminance. Said parameters, which are held in the image reproduction parameter determination section (element 32 of Figure 1), are then used by the image reproduction processing section (element 35 of Figure 1) to produce image data. As a result, the combination of the parameter determination section and the processing section as disclosed in Shiraiwa is analogous to contrast correction means as stated in the application.

With regards to claim 8, the combination of Shiraiwa and Tokuyama discloses a system comprised of character region extracting means, sharpening means and luminance correction means. Shiraiwa further discloses performing image reproduction processing on an image where the pixels are represented by three color components (Shiraiwa column 3, lines 65-68 with column 4 lines 1-19). Shiraiwa discloses performing image reproduction processing on digital RGB data, which is analogous to a case where luminance is represented by the sum of predetermined three color components as stated in the application.

9. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiraiwa and Hayashi, and further in view of Kuo (US Patent 5,982,926). The arguments as to the relevance of the aforesaid combination are incorporated herein.

With regard to claim 11, which is representative of claim 12, Shiraiwa discloses a contrast estimation means for estimating contrast of an input image and a luminance correction means for raising the contrast of an input image. Shiraiwa does not define the contrast in terms of a luminance corresponding to lines and dots in the image and a luminance corresponding to the background of the image. Shiraiwa also fails to expressly disclose that the contrast of the image is raised to a maximum contrast corresponding to a lower limit of luminance (Vmin) and an upper limit of luminance (Vmax).

Kuo defines the contrast of the input image in terms of luminance components ymin and ybkg ([ymin,ybkg]) (column 9 line 38). Luminance term ymin corresponds to the foreground of a textual image document (column 9, lines 29-30 and column 9, line 11). The foreground of a textual image document as disclosed in Kuo is analogous to lines and dots generated in the input image as stated in the application and luminance term ymin from Kuo is analogous to Lv as stated in the application. Luminance term ybkg corresponds to the background of an image (column 9, lines 19-21) and is analogous to luminance term Hv as stated in the application.

Kuo further discloses enhancing the contrast of the image by mapping the luminance component from [ymin,ybkg] to [YMIN,YMAX], where YMIN and YMAX are, respectively, the minimum and maximum Y values of available luminances (column 9, lines 37-41). The term [YMIN,YMAX] disclosed in Kuo is analogous to [VMIN,VMAX] as stated in the application. The idea of enhancing contrast by mapping luminance components as disclosed in Kuo is analogous to raising the contrast as stated in the application.

It would have been obvious at the time of the invention to modify Shiraiwa's contrast estimation and luminance correction means by defining contrast of an image in terms of two luminance terms and mapping those luminance terms to minimum and maximum levels in order to enhance the contrast of the image. Such a modification would

have allowed for a method that effectively removes blurring from an image and maximizes contrast (Kuo column 9, lines 57-58). It also would have allowed for a contrast enhancing method that utilized the full range of luminance values (Kuo column 8, lines 56-57).

10. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Shiraiwa, Hayashi, and Tokuyama as applied to claims 2, 6, 8 and 10 above, and further in view of Takagi ("Selective Image Sharpening", Image Analysis Handbook. University of Tokyo Press January 17 1991, page 549).

The combination of Shiraiwa, Hayashi and Tokuyama discloses a sharpening means, but fails to disclose the exact formula that the sharpening means uses in order to correct luminance values in both character and non-character regions. Takagi discloses the exact formula utilized by the sharpening means to obtain luminance values as stated in the application.

It would have been obvious to one reasonably skilled in the art at the time of the invention to modify the image processing system disclosed in the combination of Shiraiwa and Tokuyama by including the selective sharpening method disclosed in Takagi. Such a modification would have allowed for the use of a method well known in the art in order to implement the selective sharpening of character and non-character regions. Said method could be easily implemented because of the ease with which the transition is made between the sharpening of character regions and the sharpening of non-character regions.

11. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Shiraiwa, Hayashi, and Tokuyama as applied to claim 2 above, and further in view of Pollard (US Patent 6,266,439) and Katsuyama (US Patent 6,035,061). The arguments as to the relevance of the combination of Shiraiwa and Tokuyama in paragraph 5 are incorporated herein.

With regards to claim 4, Tokuyama further discloses a character region extracting means that extracts a region in which the difference between the maximum value and minimum value of luminance of the plurality of pixels in the respective regions is not less than a reference difference value (column 5 lines 6-28,44-51). A block as disclosed in Tokuyama is analogous to a region containing a plurality of pixels as stated in the application. The (maximum value – minimum value) operation from Tokuyama gives a feature parameter Pa which is then compared to the region separation tables in Figure 13. These tables are analogous to a reference difference value as stated in the application. The combination of Shiraiwa and Tokuyama does not expressly disclose converting the luminance values of pixels into binary form, obtaining blocks of pixels having equal binary-coded luminance or obtaining rectangles circumscribing blocks of connected pixels. Pollard discloses converting the pixels of the image into binary form (column 4 lines 56-62). The process of snapping some pixels to white and snapping other pixels to black as disclosed in Pollard is analogous to converting the pixels into binary form as stated in the application. Pollard also discloses obtaining blocks of connected pixels with the same luminance (column 9, lines 18-22). The contiguous runs disclosed in Pollard are analogous to blocks of connected pixels as stated in the application. The

appropriately labeled status pixels disclosed in Pollard are grouped according to luminance classification and are therefore analogous to having the same luminance level as stated in the application. Katsuyama discloses integrating circumscribed rectangles overlapping one another into a single circumscribed rectangle (column 11, lines 43-48 in conjunction with Figure 15). The unification of rectangles that overlap as disclosed in Katsuyama is analogous to integrating the rectangles as disclosed in the application.

With regards to claim 5, Katsuyama additionally discloses extracting regions in nearly parallel with a predetermined axis line as character regions (column 28 lines 49-58). The table ruled lines as disclosed in Katsuyama are analogous to predetermined reference axis lines that arrange regions in parallel as stated in the application.

It would have been obvious to one reasonably skilled in the art at the time of the invention to modify the combination of Shiraiwa and Tokuyama by including the binary conversion of pixel values and the grouping together of pixels with the same luminance as taught by Pollard and the integration of circumscribed rectangles and the arrangement of character regions in parallel with a reference axis line as taught by Katsuyama. Such a modification would have allowed for a system of efficiently extracting characters from character regions in an image.

Claim Rejections - 35 USC § 102

12. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

13. Claims 16 and 27 are rejected under 35 U.S.C. 102(b) as being anticipated by Shiraiwa (US Patent 6,201,893).

With respect to claim 16, which is representative of claim 27, Shiraiwa discloses a display means with predetermined gradation characteristics (column 3, line 54 and element 40 of Figure 1: Predetermined gradation characteristics are not explicitly described in Shiraiwa, but it is well known in the art that display devices inherently have gradation characteristics associated with them.).

Shiraiwa also discloses an image input means for inputting an image composed of pixels (column 3, line 52: The reference describes a color image pickup unit (element 10 of Figure 1) that is analogous to the input means recited in the claim).

Shiraiwa discloses a contrast estimation means (discussed in the below paragraph).

Shiraiwa further discloses a luminance correction means. The 'image reproduction processing section' (element 35) is analogous to the claimed luminace correction means (Shiraiwa col. 8 lines 12-16: The reference describes using 'separately determined image reproduction parameters' to determine one specific image reproduction parameter, and then processing the image based on this parameter). Thus, Shiraiwa discloses performing luminance correction (e.g. white balance adjustment, as disclosed at col. 5 lines 27-28). Shiraiwa also discloses that the luminance correction means is based on estimated contrast (e.g. the intensity distribution, or the wiener spectrum (which is a measurement of noise power density which requires a contrast estimate for its determination), or the color range (another estimate of contrast), etc.) (col. 4 lines 20-34). Shiraiwa also discloses that the luminance correction means is based on gradation characteristics (col. 4 lines 25-27: The reference describes a 'gradation characteristic', a 'gradation conversion curve', and a 'gradation conversion look up table'). These gradation characteristics are associated with a display device, as is discussed in the above response to arguments.

Regarding the penultimate paragraph ("wherein the luminance correction means corrects the luminance of each of the plurality of pixels with the gradation characteristics of the display means"): This paragraph states the exact language of the paragraph above it, except that it recites that the luminance correction means corrects the luminance of the pixels with gradation characteristics, instead of based on gradation characteristics. This subtle distinction does not appear to alter the scope of the claim, and the paragraph thus seems quite redundant. Accordingly, the discussion of the applicability of Shiraiwa in the above paragraph is incorporated herein.

Shiraiwa also discloses that said display means display an image that has been corrected by said luminance correction means (column 4 lines 48-51).

14. Claims 17 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiraiwa in view of Kuo (US Patent 5,982,926). The arguments as to the relevance of Shiraiwa as applied above are incorporated herein.

With regard to claim 17, which is representative of claim 28, Shiraiwa discloses a contrast estimation means for estimating contrast of an input image and a luminance correction means for raising the contrast of an input image. Shiraiwa does not define the contrast in terms of a luminance corresponding to lines and dots in the image and a luminance corresponding to the background of the image. Shiraiwa also fails to expressly disclose that the contrast of the image is raised to a maximum contrast corresponding to a lower limit of luminance (Vmin) and an upper limit of luminance (Vmax).

Kuo defines the contrast of the input image in terms of luminance components ymin and ybkg ([ymin,ybkg]) (column 9 line 38). Luminance term ymin corresponds to the foreground of a textual image document (column 9, lines 29-30 and column 9, line 11). The foreground of a textual image document as disclosed in Kuo is analogous to lines and dots generated in the input image as stated in the application and luminance term ymin from Kuo is analogous to Lv as stated in the application. Luminance term ybkg corresponds to the background of an image (column 9, lines 19-21) and is analogous to luminance term Hv as stated in the application.

Kuo further discloses enhancing the contrast of the image by mapping the luminance component from [ymin,ybkg] to [YMIN,YMAX], where YMIN and YMAX are, respectively, the minimum and maximum Y values of available luminances (column 9, lines 37-41). The term [YMIN,YMAX] disclosed in Kuo is analogous to [VMIN,VMAX] as stated in the application. The idea of enhancing contrast by mapping luminance components as disclosed in Kuo is analogous to raising the contrast as stated in the application.
It would have been obvious at the time of the invention to modify Shiraiwa's contrast estimation and luminance correction means by defining contrast of an image in terms of two luminance terms and mapping those luminance terms to minimum and maximum levels in order to enhance the contrast of the image. Such a modification would have allowed for a method that effectively removes blurring from an image and maximizes contrast (Kuo column 9, lines 57-58). It also would have allowed for a contrast enhancing method that utilized the full range of luminance values (Kuo column 8, lines 56-57).

15. Claims 19, 23, 25, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiraiwa (US Patent 6,201,893) in view of Tokuyama (US Patent 6,240,206). The arguments as to the relevance of Shiraiwa as applied above are incorporated herein.

Regarding claim 19, which is representative of claim 29, Shiraiwa discloses a display means having predetermined gradation characteristics, an image input means for inputting an image composed of a plurality of pixels and a luminance correction means that corrects the luminance of pixels constituting an image based on gradation characteristics. Shiraiwa additionally discloses that said display means displays the image in which the luminance of each of the pixels has been corrected by the luminance correction means. Shiraiwa does not disclose a character region extraction means or a sharpening means.

Tokuyama discloses a character region extracting means for extracting character regions from an image (column 2, lines 20-28). The region separating section (element 12, Figure 1) as disclosed in Tokuyama is analogous to a region extracting means as stated in the application.

Tokuyama discloses carrying out sharpening for the character region at a sharpening level higher than the level of sharpening performed for the remaining regions (Tokuyama col. 11 line 37 – col. 12 line 16 in conjunction with Figure 10). This occurs in the event that the value of XB is between 0 and –25000, the value of XA is between 0 and 50000, and the value of XC is between 0 and 25000. In this situation, the photographic and spot regions (which correspond to XA and XC, respectively) are filtered at one of the predetermined sharpening levels shown in Figures 11(a)-(i) and the character region (which corresponds to XB) is filtered at a sharpening level higher than the other regions. The degree of enhancement as disclosed in Shiraiwa is analogous to the level of sharpening recited in the claim.

It would have been obvious to one reasonably skilled in the art at the time of the invention to modify the image processing system of Shiraiwa to include character region extraction means and sharpening means for sharpening character regions at a higher level than non-character regions as taught by Tokuyama. Such a

modification would have allowed for an image processing apparatus capable of improving the quality of an image comprised of character regions and non-character regions.

With regard to claim 23, Shiraiwa discloses contrast correction means for raising the contrast of the image on the basis of estimated contrast (Shiraiwa column 6 lines 53-59). Shiraiwa discloses performing luminance distribution smoothing processing on an image on the basis of its contrast. Luminance distribution smoothing is a method well known in the art for enhancing the contrast of an image. Enhancing the contrast of an image is analogous to raising the contrast of an image or lowering it as needed based on the histogram of luminance levels (column 6 lines 57-58). Said luminance distribution smoothing determines image reproduction parameters for pixel luminance. Said parameters, which are held in the image reproduction parameter determination section (element 32 of Figure 1), are then used by the image reproduction processing section (element 35 of Figure 1) to produce image data. As a result, the combination of the parameter determination section and the processing section as disclosed in Shiraiwa is analogous to contrast correction means as stated in the application.

With regards to claim 25, the combination of Shiraiwa and Tokuyama discloses a system comprised of character region extracting means, sharpening means and luminance correction means. Shiraiwa further discloses performing image reproduction processing on an image where the pixels are represented by three color components (Shiraiwa column 3, lines 65-68 with column 4 lines 1-19). Shiraiwa discloses performing image reproduction processing on digital RGB data, which is analogous to a case where luminance is represented by the sum of predetermined three color components as stated in the application.

16. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Shiraiwa and Tokuyama as applied to claim 19 above, and further in view of Takagi ("Selective Image Sharpening", Image Analysis Handbook. University of Tokyo Press January 17 1991, page 549).

The combination of Shiraiwa and Tokuyama discloses a sharpening means, but fails to disclose the exact formula that the sharpening means uses in order to correct luminance values in both character and non-character regions. Takagi discloses the exact formula utilized by the sharpening means to obtain luminance values as stated in the application.

It would have been obvious to one reasonably skilled in the art at the time of the invention to modify the image processing system disclosed in the combination of Shiraiwa and Tokuyama by including the selective sharpening method disclosed in Takagi. Such a modification would have allowed for the use of a method well known in the art in order to implement the selective sharpening of character and non-character regions. Said method could be easily implemented because of the ease with which the transition is made between the sharpening of character regions and the sharpening of non-character regions.

17. Claims 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Shiraiwa and Tokuyama as applied to claim 19 above, and further in view of Pollard (US Patent 6,266,439) and Katsuyama (US Patent 6,035,061). The arguments as to the relevance of the combination of Shiraiwa and Tokuyama in paragraph 5 are incorporated herein.

Regarding claim 21, Tokuyama further discloses a character region extracting means that extracts a region in which the difference between the maximum value and minimum value of luminance of the plurality of pixels in the respective regions is not less than a reference difference value (column 5 lines 6-28,44-51). A block as disclosed in Tokuyama is analogous to a region containing a plurality of pixels as stated in the application. The (maximum value – minimum value) operation from Tokuyama gives a feature parameter Pa which is then compared to the region separation tables in Figure 13. These tables are analogous to a reference difference value as stated in the application. The combination of Shiraiwa and Tokuyama does not expressly disclose converting the luminance values of pixels into binary form, obtaining blocks of pixels having equal binary-coded luminance or obtaining rectangles circumscribing blocks of connected pixels. Pollard discloses converting the pixels of the image into binary form (column 4 lines 56-62). The process of snapping some pixels to white and snapping other pixels to black as disclosed in Pollard is analogous to converting the pixels into binary form as stated in the application. Pollard also discloses obtaining blocks of connected pixels with the same luminance (column 9, lines 18-22). The contiguous runs disclosed in Pollard are analogous to blocks of connected pixels as stated in the application. The appropriately labeled status pixels disclosed in Pollard are grouped according to luminance classification and are therefore analogous to having the same luminance level as stated in the application. Katsuyama discloses integrating circumscribed rectangles overlapping one another into a single circumscribed rectangle (column 11, lines 43-48 in conjunction with Figure 15). The unification of rectangles that overlap as disclosed in Katsuyama is analogous to integrating the rectangles as disclosed in the application.

Regarding claim 22, Katsuyama additionally discloses extracting regions in nearly parallel with a predetermined axis line as character regions (column 28 lines 49-58). The table ruled lines as disclosed in Katsuyama are analogous to predetermined reference axis lines that arrange regions in parallel as stated in the application.

It would have been obvious to one reasonably skilled in the art at the time of the invention to modify the combination of Shiraiwa and Tokuyama by including the binary conversion of pixel values and the grouping together of pixels with the same luminance as taught by Pollard and the integration of circumscribed rectangles and the arrangement of character regions in parallel with a reference axis line as taught by Katsuyama. Such a modification would have allowed for a system of efficiently extracting characters from character regions in an image.

18. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Shiraiwa and Tokuyama as applied to claim 19 above, and further in view of Yamazaki (US Patent 5,801,791). The arguments as to the relevance of the combination of Shiraiwa and Tokuyama as applied in paragraph 5 are incorporated herein.

The combination of Shiraiwa and Tokuyama discloses contrast estimation means that generate a histogram of pixel luminance for an image. It does not disclose estimating contrast by splitting the histogram into two ranges and comparing maximum luminance values of the ranges to predetermined reference values. Yamazaki discloses splitting a histogram into two ranges based on the average brightness of the input data (column 2 lines 46-51). Yamazaki further discloses using a maximum value and a minimum value from the ranges in order to estimate contrast (column 2 lines 18-31,51-54).

It would have been obvious to one reasonably skilled in the art at the time of the invention to modify the combination of Shiraiwa and Tokuyama by including contrast estimation means that split a luminance histogram into two ranges and find maximum and minimum values from those ranges. Such a modification would have allowed for a way to display the character regions of an image with a clear outline. (Yamazaki column 1 lines 53-54).

19. Regarding claims 14, 15, 18, and 26: These claims have a 112(2) problem that is discussed above. In light of this 112(2) problem, the examiner will interpret these claims to add the limitation that was added by the amendment to claims 1 and 2. Since this limitation has already been discussed above in the context of the Shiraiwa and Hayashi references, additional discussion would be redundant.

Conclusion

20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patrick L Edwards whose telephone number is (571) 272-7390. The examiner can normally be reached on 8:30am - 5:00pm M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joe Mancuso can be reached on (571) 272-7695. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Patrick L Edwards Art Unit 2621

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ANDREW W. JOHNS
PRIMARY EXAMINER